Dr. Holland says that he knows of no other opening through which the auditory nerve could escape from the brain cavity; but unfortunately he did not think it necessary to indicate the distribution of this nerve.

The writer knows of no fossil skull that is better fitted for section than the one described by Director Holland. Had it been divided along the median plane and had the matrix then been removed, much valuable information would have been secured. Probably some sutures that do not show on the rough outer surface would reveal traces of themselves on the inner surface; and important suggestions regarding some of the foramina would offer themselves. Especially, it would then be possible to obtain a complete cast of the brain-cavity of this interesting dinosaur.

Two long splints of bone which extend from the premaxillæ to the front of the external nares, joining along the midline, were supposed by Marsh to be processes of the premaxillæ. Dr. Holland regards them as distinct bones and suggests that they are the lateral ethmoids. It would be interesting to learn how the lateral ethmoids could migrate from the prefrontal region and come to lie on the midline in front of the nostrils. It is very doubtful whether the splints are distinct from the premaxillæ.

The bone called the presphenoid by Dr. Holland is the parasphenoid.

As is well known, the nostrils of *Diplodocus* lie far toward the rear of the skull, between the orbits. On each side of the face, far in front of the orbits, there is found a fontanel in each maxillary bone. This opens into the cavity above the pterygoid bones. Dr. Holland suggests that these openings were probably a pair of supplementary nostrils. From what we know about the development of the rectum it is imaginable that a nasal passage might divide into two passages, and that one of these might remain in its place while the other, with its external opening, might migrate to where we find it in *Diplodocus*. But had this happened in *Diplodocus* the nostril that retained its primitive position would be represented by one of the two clefts found near the midline at the front of the long premaxillary splints already mentioned, which clefts, as Dr. Holland says, opened into the nasal passages. If then the maxillary fontanels were also supplementary nostrils, we should have an animal with three pairs of nostrils. As to those in the maxillæ, it would, I think, be difficult to explain their morphogeny. We must certainly look on the proposition as a fanciful one. I see no reason to doubt that the fontanels in the maxillæ were in life filled with connective tissue and covered over by the skin.

In a foot-note Dr. Holland informs us that certain groups of reptiles have no external ears and that *Diplodocus* probably lacked these organs; but we should like to know what reptiles do have external ears.

In nearly all of Dr. Holland's references to the two skulls of *Diplodocus* in the U. S. National Museum he gets the numbers 2672 and 2673 exchanged. Apparently only the reference on page 239 is correct. On page 235 he credits to the U. S. National Museum two specimens that are in the American Museum of Natural History, New York, Nos. 545 and 969.

OLIVER P. HAY

THE SPREADING OF MENDELIAN CHARACTERS

THE point made by Mr. Hardy in his note on "Mendelian Proportions in a Mixed Population" in SCIENCE of July 10, 1908, is a very important one, though it is open to a dangerous misunderstanding. What Mr. Hardy gives us is a mathematical proof that *under the assumptions of Mendelian inheritance* a dominant character does not tend to spread or a recessive character to die out. A *strictly Mendelian* character would not tend either to increase or diminish its representation in a species, unless favored or opposed by selection. This is a mathematical confirmation of the biological evidence that Mendelism has no relation to evolution.

Nevertheless, the proviso of strict Mendelian inheritance robs the demonstration of a truly biological significance and forbids us to rely on it as a protection against the spread of brachydactyly or other abnormal characters in man himself or in our domesticated plants and

animals. In other places I have attempted to show the need of definite recognition of the fact that the transmission of characters is quite distinct from expression.[1]

The spread of a character through a group by transmission does not appear to have any relation to the frequency with which the character comes into visible expression. In their ability to spread through species recessive characters have a distinct advantage over dominant characters. In the presence of an adverse selection a recessive or latent character could continue to spread, even in spite of the elimination of all the individuals in which the character came into expression, whereas a dominant character would be destroyed as soon as its representatives were exterminated.

It is also known that the potency, or power of a character to come into expression, is subject to pronounced changes, even among different individuals of the same stock. Thus one of Professor Davenport's tailless fowls produced only tailed chicks, though the Mendelian reckoning called for large percentages of tailless birds. And yet the tailless character reappeared in Mendelian proportions in the progeny of a son of the same bird.[2]

Thus the biological probabilities regarding brachydactyly are altogether different from the mathematical calculations based on the Mendelian assumption that parental characters are *transmitted* by only half of the germ-cells. The biological indication is that brachydactyly is *transmitted to all the descendants* of a brachydactylous ancestor, and is likely to regain expression, or even to become prepotent, in any generation, near or remote.

O. F. Cook

Washington,
July 16, 1908

[1] "Transmission Inheritance distinct from Expression Inheritance," Science, N. S., XXV., 911. "Mendelism and Other Methods of Descent," *Proc. Wash. Academy of Sciences*, IX., 189. "Heredity Related to Memory and Instinct," *Monist*, XVIII., 263.

[2] "Altogether, out of 200 offspring of this tailless cock, where I expected 90 per cent. tailless birds, I got not one. On the other hand, using some of the same hens with another cock (the son of No. 117), from 50 offspring, where I expected 25 tailless, I got 24 tailless. In No. 117, although tailless, the tailed tendency strongly dominates over taillessness, so that not in the first nor in the second hybrid generation does taillessness appear, and of the Mendelian segregation in the second hybrid generation there is no trace! On the other hand, another cock reveals typical Mendelian phenomena." See Davenport, C. B., 1907. "Heredity and Mendel's Law," *Proc. Washington Academy of Sciences*, IX., 184.

SCIENTIFIC BOOKS

A Text-Book of the Principles of Animal Histology. By Ulric Dahlgren, Assistant Professor of Biology in Princeton University, and William A. Kepner, Adjunct Professor of Biology in the University of Virginia. Pp. xiii + 515. Price, $3.75. New York, Macmillan Company. 1908.

This book is so unlike the usual text-books of human and mammalian histology that it will seem like an entirely new subject to most readers. It comes as a welcome relief from the multitude of text-books which differ from one another only in the order and arrangement of the subjects treated. For many years the comparative method has been recognized as the "saving salt," as Michael Foster expressed it, of anatomy and embryology, but strange to say, few works have attempted to deal with histology from the comparative point of view, and this subject has been adequately treated only in the case of man and of a few mammals. If we except the early pioneer work of Leydig and the incompleted work of Fol, the only works which deal specifically and adequately with the subject of comparative histology are the large manual of Camillo Schneider and this volume by Dahlgren and Kepner, and the present work is, I believe, the first attempt which has been made in English to put histology upon a comparative basis.

The purpose of the authors is clearly stated in the preface to be

> To produce a work that covers the general field of histology, and is not restricted in the main to human and mammalian forms. It is intended to be a work that teaches general principles and